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United States Department of Agriculture,
DIVISION OF GARDENS AND GROUNDS.

AN EXPERIMENT IN TEA CULTURE.

A Report on the Tea Gardens of Dr. Charles U. Shepard, Pinehurst, S. C.

INTRODUCTORY.

The accompanying account of tea culture as now carried on at Pinehurst, S. C., is the result of a trip undertaken in accordance with the following letter of instructions:

WASHINGTON, D. C., June 5, 1897.

WILLIAM SAUNDERS,
Horticulturist.

SIR: You will at earliest convenience proceed to Summerville, S. C., and visit the farm of Charles U. Shepard, esq., at the above place, with a view of gaining a general knowledge of the prospects of the probable introduction of the tea plant as a profitable industry in the United States.*

JAMES WILSON,
Secretary.

In compliance with these instructions, I visited Dr. Shepard's plantation near Summerville and accompanied him through his various tea gardens. Dr. Shepard answered all questions freely and kindly, and explained the details of the cultivation of tea.

Seventeen years ago the writer prepared an article under the heading, "Tea culture as a probable American industry," which was mainly intended as an answer to the many requests received by the Department as to the status of tea culture in the United States.

For twenty years previous tea plants had been annually distributed in varied quantities, until the object of these distributions became a matter of inquiry, and the recipients were desirous of being informed whether or not the Department deemed it expedient to encourage the culture of tea plants as a profitable commercial industry, or merely for domestic use in a limited way. This latter purpose was, as far as could be, recommended, although it was believed that at the best the tea would probably be a rather poor substitute for the prop-

* See table showing imports on last page.

erly prepared article. So far as a study of successful conditions, as presented in tea-growing countries could determine, it was apparent that various adverse factors had to be encountered here, and they seemed insurmountable. The principal of these drawbacks were the cost of labor and a deficiency of rainfall. The prices paid for labor in Asiatic countries are so meager that the idea of competition in this country could not be seriously entertained, and the amount of rainfall considered necessary for profitable growth is greatly in excess of any registered precipitation in any part of the United States. These and other salient points were noted in the article alluded to, which, upon the whole, gave but little encouragement to the expectation of growing tea profitably in this country. It concluded with the following summary:

It will probably be many years before tea culture will engage the general attention of planters and farmers of this country. There are many reasons why this may be expected. The profits of the industry are not established; the management of the plant and proper application of the processes of manufacture must be, for many years, of a purely experimental character; and even where seemingly fair tests have been made, failures will occur. Although these failures may be traced to causes which persistent effort would overcome, yet where there is outlay and loss, accompanied with some doubt as to ultimate success, the effort will in most cases be abandoned.

PINEHURST GARDENS.

The estate of Pinehurst comprises about 700 acres. The surface throughout is gently undulating, and the soil mainly a sandy loam; in some of the lower parts it is composed of a certain amount of peaty matter, but these portions are confined to small areas. The domain is well supplied with belts and groups of natural tree growth, among which the Southern, or long-leaved, pine (*Pinus palustris*) abounds. In the home grounds, mainly devoted to ornamental purposes, many stately specimens of this tree are to be seen.

It should be understood that in all tea-growing countries the plantations are called tea gardens. Whether the area under cultivation is 1 acre or 1,000 acres, it is recognized as a garden, and in all features of the industry this appellation is universally employed.

The first garden visited at Pinehurst in company with Dr. Shepard was one of about 2 acres in extent, where the pickers were busy collecting a "flush," a term which means a crop of young leaves.

Having grown many thousands of tea plants and being familiar with methods of culture in India, so far as verbal information from growers and illustrations could convey ideas of management, the writer saw at first glance that he was looking upon a tea garden of perfect cultivation. The first attraction of such a garden is the remarkable color of the foliage, a deep velvety green, shining with vigorous health on the lower leaves of the plants. The uniformity

and perfection of shape of the plants, indicative of skillful pruning, is next noticeable. Skill in pruning is also apparent in the vigorous growth of the young shoots, giving succulency to the leaf and promoting rapid development of continuous flushings. All these features combine to form a scene of uncommon interest to the appreciative observer.

Dr. Shepard has tea gardens planted on different sites. This is for the purpose of experiment with varied aspects and varied conditions of soils. Also, having many varieties of plants from different countries and from various altitudes in these countries, he forms a garden of each variety by itself. But on all sites and with all varieties of plant a healthy, vigorous growth predominates. Dr. Shepard has proved beyond question that many of the varieties which are considered inferior have become so through neglect and injudicious culture. Chinese kinds, which at first produced narrow, hard leaves on scrubby bushes and were altogether unprofitable, are, with generous treatment, yearly improving in size and quality of leaf. This leads Dr. Shepard to believe that many of the so-called semiestablished varieties are merely the result of methods of culture, or, rather, of neglect, and that by his mode of treatment he will ultimately blend them all into the possession of equally good qualities.

When Dr. Shepard resolved to experiment in the culture and manufacture of tea he was quite familiar with the tea plant in South Carolina, where it has been growing for nearly a century; he was also conversant with all previous efforts in trying to grow tea with profit and their results; but he felt assured that these results were not by any means conclusive, as they were based upon practices prevalent in countries where climatic conditions and other important factors to success were greatly different from those existing here. He recognized that the problem of adaptation required the prosecution of a series of studies which, so far as known, had never been taken up.

Among the problems to be solved was that of growing tea in a district which had a yearly rainfall of 56 inches, while Asiatic authorities claim that for tea growing it should not be less than 80 to 100 inches per annum, and the more of this that falls during the early part of the year the better. Some of the best tea districts have 120 inches of yearly rainfall. Again, it is found that authorities agree in the opinion that the temperature should never be lower than 40° F.; for although it is well known that the tea plant will exist in climates where the thermometer may reach zero, yet the best production is obtained from plants where frosts do not prevail. At Summerville 15° F. may be expected during winter.

In everything connected with this industry Dr. Shepard has had to be guided almost solely by his own experiences and observations. Literature relating to the subject is plentiful, but all of it relates to

countries where the climatic and other conditions leading to success are so different from those in South Carolina that it proves to be of but little general value, and of no specific value whatever.

THE QUESTION OF MOISTURE.

The profitable production of tea depends principally upon rainfall or the presence of moisture in the soil. With an ample supply of water the plants are maintained in constant vigor, and the operations of manufacture proceed uninterruptedly during the whole period of active growth. In districts favored with sufficient heat and rains the plants furnish from fifteen to twenty pickings yearly. In some parts of China the plants are picked four times only. Of course, something depends upon the soil; if it is poor, the growths will be limited compared to what will be realized if it is rich, although the rainfall may be the same in both cases. The condition of the soil is specially important where there is a lack of rain, as then the richest soil will support the best growth.

To establish a system of soil treatment that would as far as practicable compensate for the scarcity and unequal distribution of rainfall, Dr. Shepard concluded to pay particular attention to its physical condition and its relation to air and moisture. He, therefore, as a first step toward improvement and as a foundation for others that may follow, underdrained his land; it was afterward plowed deeply, followed with a subsoil plow, stirring up and pulverizing to a depth of 18 inches or more. This system of soil preparation is not confined to low grounds or those seemingly wet, but it is applied to high and rolling lands, in order to prevent the rapid flow of rainfall from the surface and washing of the soil. It is now recognized that draining, in connection with deep cultivation, secures a more ample and lasting supply of moisture in dry times, and maintains the continuous growth of vegetation during even severe droughts. This is well exemplified in these tea gardens, those on rolling grounds showing a verdant color of leaf equally with those on lower and richer looking spots. This conservation of moisture is further enhanced by a careful system of surface culture which prevents, in a great degree, the evaporation of moisture from the upper stratum of soil. Thus, a gain of moisture equivalent to a fall of 10 to 15 inches of rain is secured.

THE QUESTION OF LABOR.

In all considerations relating to the profitable culture of tea in this country the labor question is always a dominant factor. It has seemed impracticable to compete with the cheap labor of Oriental peoples, and while some of the processes of manufacture have been delegated to machinery, the picking of the leaves, requiring discrimination in selection, has to be done by hand. At the lowest estimate,

it costs about eight times more to pick one pound of tea in South Carolina than the prices paid for the same service in Asia. This is the most serious consideration that presents itself to the tea growers here.

Dr. Shepard soon found himself face to face with this problem of labor. His tea gardens not being of sufficient area to employ a constant force, in the gathering of the first flush he would obtain any week all the pickers required, but when the next flush became due he would find his former pickers scattered and unobtainable just when most needed. In this way his operations were so embarrassed as to entail loss, for it is all important to pick leaves when at their best condition, which is of short duration. They rapidly develop beyond the requisite of tenderness, after which they are not fit for use.

After bestowing much thought on methods for the betterment of this state of affairs, Dr. Shepard matured plans and put them into execution, and is so far well pleased with the result. He built a school-house, a comfortable, home-like, cottage building, having ample well-furnished rooms, containing all the requisites for teaching. After engaging a competent teacher, he invited the colored families of the neighborhood to send their children to his school free of charge. They would be taught reading and writing and such other accomplishments as are ordinarily to be learned in primary schools; they would also be taught to pick tea, and thus earn money to help buy them food and clothing. This offer was favorably received and acted upon, so that Dr. Shepard has a goodly list of scholars, from which he draws his pickers in numbers as required.

Of course, there are many of them too-young for fieldwork; but the work is light, great strength not being needed, and the youngsters like it, speedily learning the art. At first they require instruction and close attention until they become sufficiently expert to pick only leaves of proper age. This is the foremost requirement, and one which depends upon nicety of touch of the fingers in rapidly passing over the young leaves and deciding at once as to what to pick and what to reject. This once learned, the quantity of leaves picked by the children is increased as they become accustomed to the work. Some of the pickers are quite expert, although none of them reach as yet the quantities credited to expert pickers in Asiatic tea gardens. It is not easy, however, to make a comparison, as these latter pick larger leaves and make inferior teas. Dr. Shepard picks only the most delicate leaves; for the principal, if not the only mode of making a profitable crop here, is to put on the market a tea superior to any now found in the trade. This he is doing at present.

Sometime ago a gentleman largely engaged in tea culture in Ceylon visited these Pinehurst gardens, and on inspection pronounced the tea of first quality. Afterward, on watching the pickers and

noticing the care exercised by them in selecting the finest leaves only, he remarked to Dr. Shepard: "If I bestowed as much care in picking as you do, I could make a quality of tea as good as yours." This was very high praise, coming from such a source.

SEED AND RAISING PLANTS.

The older varieties of tea plant, such as produced in China, will stand 25 degrees of frost, while the Assam kinds are comparatively tender; but all authorities maintain that the less frost the plants receive the better the tea. This applies even to the hardiest varieties; frost lowers their value. At Summerville the thermometer is liable, any winter, to run down to 15 degrees. It has consequently been Dr. Shepard's aim to procure the kinds that will produce fine tea and suffer least from frost. He has, therefore, in this line of experiment, imported seed from all tea regions, especially from high altitudes. These importations have been very costly and mostly unsatisfactory, since much of the seed has lost its vitality from the long voyage and from delays in the New York custom house. If one-half of the seeds vegetate he considers that he is doing well; but one-third is a general average, and a loss of a whole importation is no novelty. Seeds from the higher grades of Ceylon and Assam productions have turned out plants too tender for the climate. His most promising variety at present was brought from Darjeeling, and from an elevation upward of 3,000 feet.

He expects good returns from the garden set with these plants, as they seem to combine hardiness with good-sized, delicate leaf.

Seeds, when received, are at once sown in beds of light, fibrous soil, and shaded from the direct sun. Young tea plants can not stand the sun. Their native habitat is as an undergrowth in shady forests. In a few months the young seedlings are large enough to be transplanted. There is nothing particular in this operation beyond the ordinary treatment of removal of similar plants, except that after planting they are shaded on the southwest side. This is usually effected by inserting a broad shingle on that side of the plant.

SYSTEM OF PRUNING.

No single operation in the management of tea gardens at Pinehurst is more interesting to a practical plant grower than the system of pruning. This has been reached after a long study of various methods, some of which have proved disastrous. The constant removal of young leaves during the summer has a tendency in the tea plant, as in all other plants, to check growth of root, and thus weaken vitality. The practice in Indian gardens is to grow and pick the plants for three or four years without winter pruning, then prune severely,

afterward allowing them to remain one season without picking in order that they may increase in root growth and thereby regain vigor. This mode of treatment would not be profitable in South Carolina and would not produce the character of leaf essential to success.

Here the pruning is directed first to the gradual extension of the breadth of the plant without greatly increasing its height, but increasing the number of shoots available for picking; and, second, to secure strength in these shoots, so that their vigor is maintained up to the last flush, and they are able to respond quickly in the production of new leaves after each picking.

It is apparent that these requirements are admirably secured by the system adopted by Dr. Shepard. Instead of the plants undergoing a severe pruning every fourth year with a subsequent loss of crop for one season, they are partly renewed annually. There seems to be no reason why they may not be maintained in usual vigor for forty years instead of four.

The pruning at Pinehurst is so carefully performed that it is the most costly manipulation in the whole management, as it is evidently one of the greatest importance in regard to the value of the product.

The writer saw the whole process of manufacture from the gathering of the leaf to the packing of the finished tea. It is not a tedious operation, nor a costly one, but a thorough knowledge of the business is indispensable, for a great deal of the value of tea is in its preparation.

With reference to the future of tea culture in the United States and the encouragement for its extension, Dr. Shepard stated that if he were twenty years younger he would plant 500 acres as rapidly as he could procure the plants. This indicated his faith in tea raising as a profitable industry.

NEED OF STUDENTS OF TEA CULTURE.

When the far-reaching extent of Dr. Shepard's knowledge of tea industry in this climate is realized, his patient and successful efforts in overcoming obstacles, his clear perceptions of the principles governing plant growth, and the adaptation of cultural methods and appliances for the amelioration and enrichment of soils, his faculty of close observation of minute essentials in all details, and the long series of tedious and costly experiments which have accompanied every branch of his work, one is strongly impressed with the necessity of this knowledge being communicated to others. It was suggested to open a class for pupils, so that energetic young men could fit themselves as experts in this business, as there doubtless will be a demand for such qualifications in the future of tea culture. Should it become necessary to supply Dr. Shepard's place, there is not a person in the

United States, nor out of it for that matter, who could manage this establishment successfully on the lines upon which it is now operated.

Dr. Shepard has a vast amount of chemical analyses in contemplation, which he considers of urgent necessity in the further prosecution of his work. The influence of different fertilizers on the quality of teas is not the least of these investigations. But while he has more than a national reputation as a chemist, the management of his estate and the varied projects on hand so fully occupy his time that he can not add to his duties or undertake additional work. He will, however, keep the matter in sight until it can be accomplished.

PINEHURST GARDEN PARK.

These notes would be incomplete without a brief allusion to the more strictly ornamental features of Dr. Shepard's place. Between 50 and 60 acres are devoted to the culture of ornamental trees and shrubs, of which there is a notably fine collection. This part of the estate is somewhat regularly dotted over with large native pine trees, under whose shade and shelter all introduced plants seem to flourish. Dr. Shepard reveres these old pines, and in laying out his roadways and paths he would not permit the removal of even one of them.

On first entering the main avenue of the estate, attention is at once attracted to the number and luxuriant appearance of various evergreen plants, Deodar cedars in quantities, Retinosporas, Biotas, Magnolias, Camellias, Cupressus, Junipers, etc. Extensive groups of Cape Jasmines (Gardenias) were freely scattered over the grounds, not in groups of two and three, but in dozens, with flowers as large as magnolias, and filling the air with their fragrance. A path bordered with Hydrangeas in flower was specially fine; these plants average 5 feet in height and as much in breadth. They were the finest in flowers that I have ever seen. The flower heads were enormously large and of an intense blue color. Roses by the acre were planted in lines and cultivated like a cornfield, while others were on trellises 10 feet in height, covered with foliage and flowers. The rose buds were equal to those found in northern rose houses, as one would expect from the heavy growth of the plants. A space of one acre was massed with Chinese Azaleas, which must have been a rare sight when flowering, judging from the number of withered petals still on the plants.

Everything is set out in large groups, as befits the extent of the grounds. Camphor trees appeared in perfect health, notwithstanding the somewhat northern latitude for this species. Their presence suggested the hope that some person would take hold of this tree and do for it what has been done by Dr. Shepard for the tea plant, and thus

pave the way for an additional industry in the production of commercial camphor. Hedges are freely introduced, many different plants being used for the purpose, such as Privets of various species, Spiræa, Hibiscus, Lagerstremias, and Citrus trifoliata, the latter producing a formidable outside hedge, proof against the intrusion of cattle.

The principal avenues are defined and edged by low-kept hedges of tea plants, which seemed to harmonize pleasingly with the tall pines, where a closely-mown sod edging would really look out of place. These tea plants also afford pickings, so that the combination of the ornamental with the useful is happily secured. There are also fruit gardens containing Japan plums, Le Conte and other pears, grapes, pecans, and Japan persimmons, the latter forming trees of great beauty, with showy glossy leaves as large as a magnolia. Figs are there in great profusion, masses of them being met with in various parts of the grounds. The limited time prevented seeing as much of the grounds as might have been desired, but I saw enough to surprise me that so much has been perfected in the eight years that had elapsed since the commencement of these improvements.

This park is open to the public, a privilege extensively enjoyed. Until recently visitors were welcome to all the flowers they wished, but as this entailed labor in cutting and gathering, and was followed by other expenses, Dr. Shepard now makes a small charge, the proceeds being contributed to a local charitable institution.

CONCLUSIONS.

With regard to the further extension of tea culture in the United States, it is yet premature to determine. In the opinion of the writer no person can succeed unless the methods laid down by Dr. Shepard are strictly adhered to. No one need attempt this culture with hope of success without experience in the practical application of the principles governing every detail. It is a special business, and will require special study, which can be best given on the ground where all the operations are being carried on. The student must serve an apprenticeship, and thus become thoroughly conversant with the science and practice of the whole culture, from the sowing of the seed to the packing of the manufactured leaf.

Then there is the ever recurring question of labor. It is evident that the industry can only be made profitable by preparing an article of strictly superior quality, and to do this more labor is required in picking the leaves than where an inferior article is made, using older and harder leaves.

The principal and first requirement, therefore, is a school of instruction, where a knowledge can be obtained of everything pertaining to the management of the plants and the manufacture of tea.

I may properly express my thanks here for Dr. Shepard's kind attentions and unremitting efforts to make my visit to Pinehurst both pleasant and profitable.

WILLIAM SAUNDERS,
Horticulturist.

Approved:

JAMES WILSON,
Secretary.

WASHINGTON, D. C., *July 20, 1897.*

The following table from Circular No. 12, Section of Foreign Markets of this Department, shows the extent of the market for tea in this country:

Imports of tea into the United States from each of the leading countries of supply during the five fiscal years 1892-1896.

QUANTITIES.

Countries from which imported.	Years ended June 30--					Annual average, 1892-1896.	
	1892.	1893.	1894.	1895.	1896.	Pounds.	P. ct.
United Kingdom...	<i>Pounds.</i> 3,305,284	<i>Pounds.</i> 2,547,361	<i>Pounds.</i> 3,744,360	<i>Pounds.</i> 3,622,984	<i>Pounds.</i> 2,665,481	3,177,094	3.4
Canada.....	839,062	785,369	626,572	1,081,972	293,422	725,279	.8
China.....	46,718,019	45,653,172	50,405,188	54,700,393	50,916,111	49,678,577	53.6
British East Indies.....	345,721	164,806	452,317	562,208	1,239,593	552,929	.6
Hongkong.....	233,836	281,451	282,404	304,820	315,788	283,660	.3
Japan.....	38,622,956	39,602,519	37,980,937	36,941,394	38,552,467	38,340,055	41.3
Other countries.....	14,161	26,609	26,939	39,687	15,510	24,581	-----
Total.....	90,079,039	89,061,287	93,518,717	97,253,458	93,998,372	92,782,175	100

VALUES.

Countries from which imported.	Years ended June 30--					Annual average, 1892-1896.	
	1892.	1893.	1894.	1895.	1896.		P. ct.
United Kingdom...	\$681,154	\$540,611	\$693,886	\$743,980	\$561,488	\$644,224	4.7
Canada.....	155,308	119,735	121,445	163,353	53,725	122,713	.9
China.....	7,914,122	7,413,984	7,697,253	7,534,354	6,966,766	7,505,296	55
British East Indies.....	65,842	32,066	79,582	83,105	166,341	85,387	.6
Hongkong.....	45,849	47,318	43,274	40,157	42,158	43,751	.3
Japan.....	5,508,347	5,699,582	5,504,411	4,601,041	4,911,448	5,244,966	38.5
Other countries.....	2,600	4,186	4,392	5,389	2,514	3,816	-----
Total.....	14,373,222	13,857,482	14,144,243	13,171,379	12,704,440	13,650,153	100

	4,311	4,0
	4,392	
57,482	14,141	

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